OPERATING SUMMARY

DUNNVILLE (REGIONAL) water treatment plant

1968

ONTARIO WATER RESOURCES COMMISSION

Division of Plant Operations

Water management in Ontario

Ontario
Water Resources
Commission

135 St. Clair Ave. W.
Toronto 7
Ontario

We are pleased to present you with the Operating Summary for the water treatment facilities operated for you during 1968.

Both the financial and technical information presented should be of assistance to your present and future planning in this important phase of municipal activity.

A new format has been devised to allow greater readability with equally detailed content. We trust that this will meet with your approval.

Our staff wish to express their appreciation for your co-operation throughout the year.

D. S. Caverly,
General Manager.

D. A. McTavish, P. Eng.,
Director,
Division of Plant Operations.

DUNNVILLE REGIONAL
water treatment plant

operated for

THE TOWN OF DUNNVILLE

THE ELECTRIC REDUCTION COMPANY LIMITED

SHERBROOKE METALLURGICAL COMPANY LIMITED

by the

ONTARIO WATER RESOURCES COMMISSION

1968 ANNUAL OPERATING SUMMARY

FOREWORD

● This operating summary outlines the project's technical capabilities and financial status in 1968. Such information mirrors past and present performance, but a major intention is to anticipate the future -- to solve problems before they occur.

The new format in which this year's data are presented is designed to offer a higher level of readability than in the past, without a corresponding decrease in compactness, accuracy and detail.

Although your Regional Operations Engineer carries the major responsibility for the contents of the report, those involved in its preparation are attached to several Commission sections and divisions. The statistics section of the Division of Plant Operations compiled the information for the graphs and charts. The draughting section of the Division of Sanitary Engineering drew the graphs. The Division of Finance provided all cost data.

Only the close co-operation of these departments allowed the publication of this summary.

CONTENTS

'68 REVIEW

The total plant output during 1968 was 3,422.07 million gallons, or an average daily plant output of 9.35 million gallons. This is an 8.1% decrease from the average daily flow in 1967 of 10.18 million gallons.

The total operating cost per 1,000 gallons was 3.06 cents as opposed to 2.84 cents in 1967 and the total cost, which includes operating costs, interest on the capital debt retirement and reserve fund charges was 9.14 cents per 1,000 gallons as opposed to 8.47 cents per 1,000 gallons in 1967.

During the fall of 1968, large quantities of algae in the raw water damaged low lift raw water screens and basket screens on the low lift pumps. On one occasion, the plant was partially shut down as staff could not cope with the large quantities of algae.

All butterfly valves on the Port Maitland high lift pumps and a 24-inch valve on the main line to Port Maitland were replaced during the year. The Eddy Current Coupling on a No. 4 high lift pump was completely overhauled for the first time since plant start-up. Mechanical seals were installed on No. 1 high lift pump replacing conventional packing on this unit. If this installation proves successful, all remaining pumps will be equipped with these.

There was one staff change during the year. Ross Root, the assistant superintendent, resigned. Harold Kelly assumed the position of maintenance technician.

PROJECT COSTS

Long Term Debt to OWRC - (Revised Estimated)

Dunnville	$ 546,880.86	
Electric	1,109,956.28	
Sherbrooke	911,769.49	
		$2,568,606.63

Debt Retirement Balance at Credit (Sinking Fund) December 31, 1968

Dunnville	$ 109,268.32	
Electric	223,952.69	
Sherbrooke	184,319.02	
		$ 517,540.03

The total cost to the participants during 1968 was as follows:

Net Operating

Dunnville	$ 19,525.23	
Electric	46,852.18	
Sherbrooke	38,484.22	$ 104,861.63

Debt Retirement

Dunnville	$ 11,036.05	
Electric	22,398.92	
Sherbrooke	18,399.51	$ 51,834.48

Reserve

Dunnville	$ 2,614.04	
Electric	5,047.13	
Sherbrooke	4,164.28	$ 11,825.45

Interest Charged

Dunnville	$ 30,698.50	
Electric	62,305.40	
Sherbrooke	51,188.19	$ 144,192.09
TOTAL		$ 312,713.65

RESERVE ACCOUNT

Balance at January 1, 1968		
Dunnville	$ 17,121.86	
Electric	41,898.65	
Sherbrooke	34,348.50	$ 93,369.01
Deposited by Participant		
Dunnville	$ 2,614.04	
Electric	5,047.13	
Sherbrooke	4,164.28	11,825.45
Interest Earned		
Dunnville	$ 1,058.11	
Electric	2,557.89	
Sherbrooke	2,091.22	5,707.22
TOTAL		$110,901.68
Less Expenditures		
Dunnville	$ 643.27	
Electric	1,545.36	
Sherbrooke	1,712.92	3,901.55
Balance at December 31, 1968		
Dunnville	$ 20,150.74	
Electric	47,958.31	
Sherbrooke	38,891.08	$107,000.13

Monthly Operating Costs

MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	SUNDRY	WATER	TRAVEL
JAN	6799.09	3384.28	-	164.91	2736.03	-	179.08	20.29	287.34	-	27.16	-
FEB	7217.71	3566.37	-	-	3266.58	-	208.56	-	69.80	106.40	-	-
MAR	9138.51	5210.77	-	125.39	2982.38	-	172.78	48.55	47.84	550.80	-	-
APRIL	8022.52	3895.64	82.22	142.68	2599.63	306.00	107.11	50.96	639.47	164.53	49.28	(15.00)
MAY	7870.89	2803.26	312.40	88.21	2848.13	1050.00	336.85	70.70	112.69	160.67	87.98	-
JUNE	7197.77	3382.13	328.68	59.16	2754.88	61.50	183.69	115.75	106.17	85.76	120.05	-
JULY	6990.59	3250.45	341.41	2.93	2896.38	-	360.58	-	-	123.76	46.90	(31.82)
AUG	5824.45	4883.89	444.22	1.57	-	-	276.81	40.37	106.43	71.16	-	-
SEPT	10119.26	3644.91	312.74	-	5698.16	-	102.11	(2.25)	299.74	63.85	-	-
OCT	9912.97	3357.03	318.85	7.68	3403.57	1356.00	197.84	413.64	795.35	-	63.01	-
NOV	10844.37	3407.61	364.24	-	3759.86	-	431.65	-	1059.83	1780.19	63.14	(22.15)
DEC	4823.50	6041.46	154.67	62.70	3241.87	-	366.80	119.25	2252.30	2684.45	-	-
TOTAL	104861.63	46827.80	2659.43	655.23	36187.47	2773.50	2923.86	877.26	5776.96	5791.57	457.52	(68.97)

BRACKETS INDICATE CREDIT

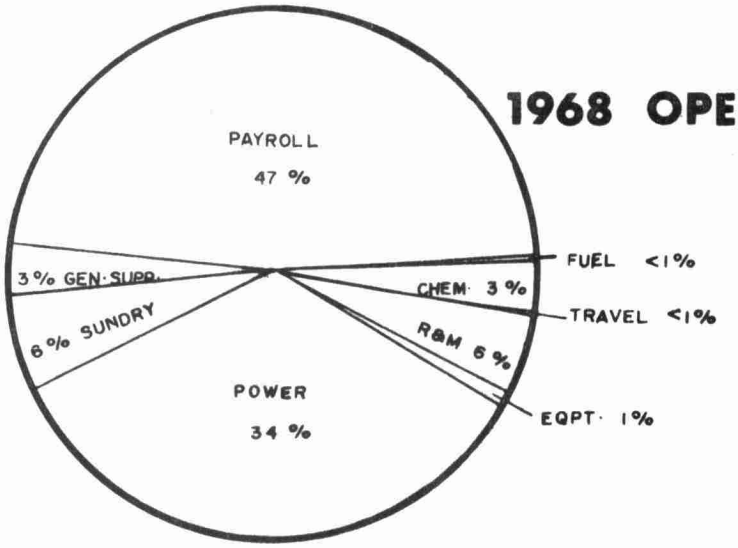
SUMMARY OF WATER COSTS

Year	M. G. Treated	Operating Cost	Operating Cost per 1,000 gallons	Total Cost	Total Cost per 1,000 gals.
1961	2245.838	$ 71,428.00	3.18¢	$276,047.37	12.29¢
1962	3214.853	85,564.88	2.66¢	297,494.48	9.25¢
1963	3726.935	95,458.82	2.56¢	309,179.48	8.29¢
1964	3719.568	99,095.96	2.66¢	312,663.35	8.40¢
1965	3692.889	98,485.34	2.67¢	311,630.93	8.44¢
1966	3802.109	98,983.63	2.60¢	308,574.01	8.12¢
1967	3714.052	105,380.00	2.84¢	314,660.32	8.47¢
1968	3422.067	104,861.63	3.06¢	312,713.65	9.14¢

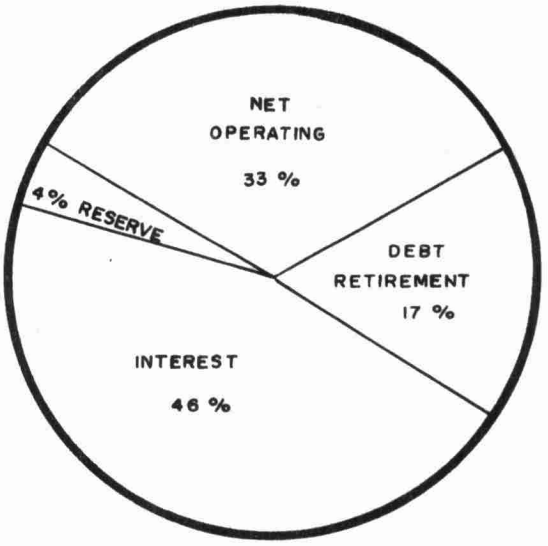
COST TO EACH PARTICIPANT IN 1968

Participant	M. G. Used	Operating Cost	Operating Cost per 1,000 gallons	Total Cost	Total Cost per 1,000 gals.
Town of Dunnville	399.081	19,525.23	4.89¢	63,873.82	16.01¢
Electric Reduction	1553.665	46,852.18	3.02¢	136,603.63	8.79¢
Sherbrooke Metallurgical	1469.321	38,484.22	2.62¢	112,236.20	7.64¢

1968 OPERATING COSTS



TOTAL ANNUAL COST



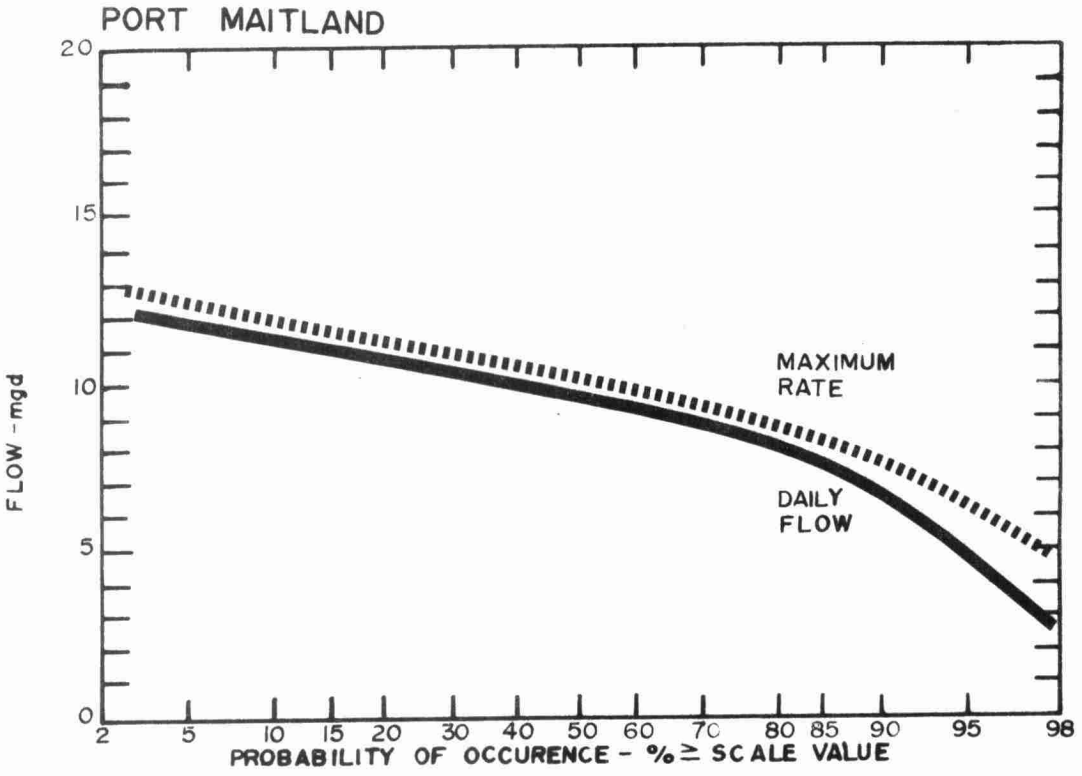
Process Data

GENERAL

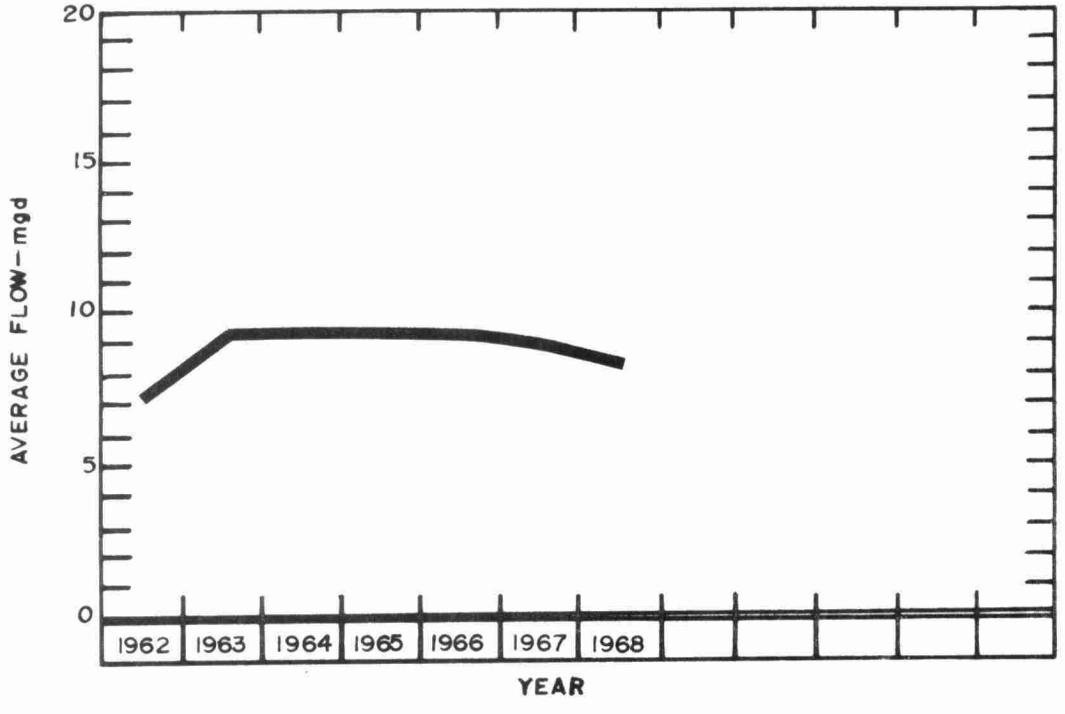
The treatment of water at the Dunnville plant consists of microstraining to remove such things as algae and gross solids. Disinfection is effected by the addition of chlorine. The following data provide information regarding the output of the plant, the quality of raw water, the quality of the treated water, and chlorine dosages necessary to maintain safe water. The quality of the water is discussed using such terms as filterability and turbidity. An effort is made to define the meaning of these terms and graphs are provided to indicate annual trends and frequency of occurrence of various values.

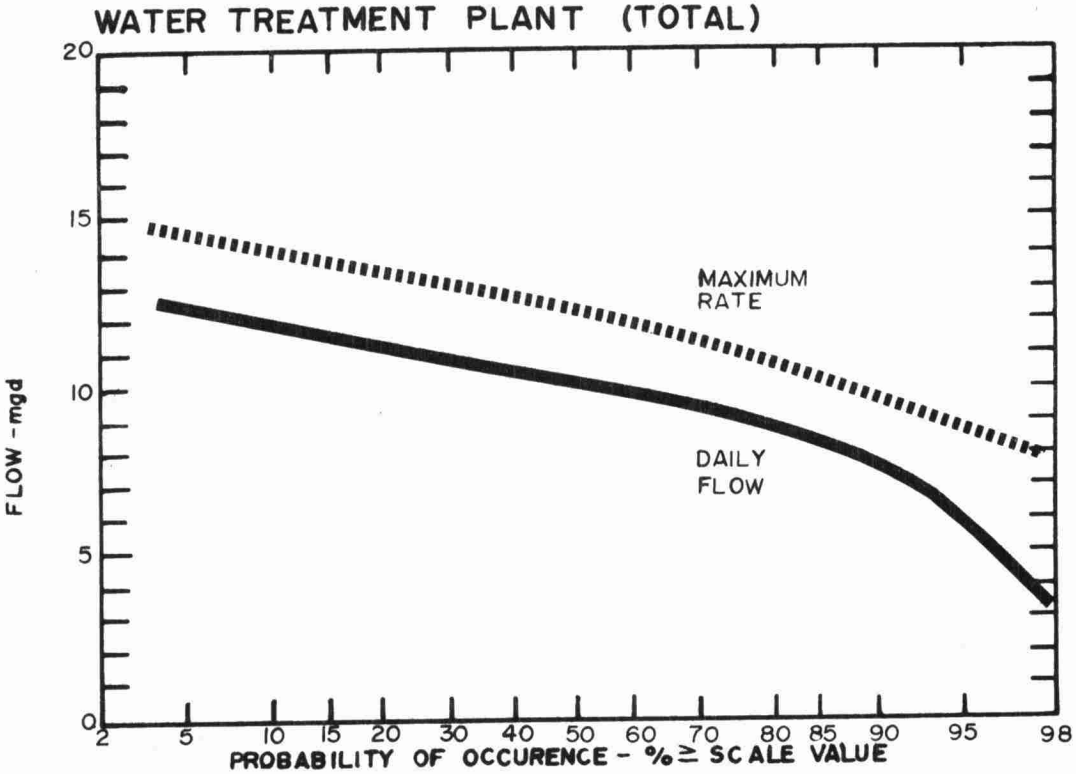
FLOWS

A total of 3,422.07 million gallons of treated water was pumped to the industries in Port Maitland and the Town of Dunnville in 1968. Total flow to the Town of Dunnville was 399.08 mg or 11.7 percent of total plant flows, Electric Reduction 1553.67 mg or 45.4 percent and Sherbrooke Metallurgical 1469.32 mg or 43 percent. The net result was a decrease in total plant flow of 8.1% in relation to the 1967 total flow.

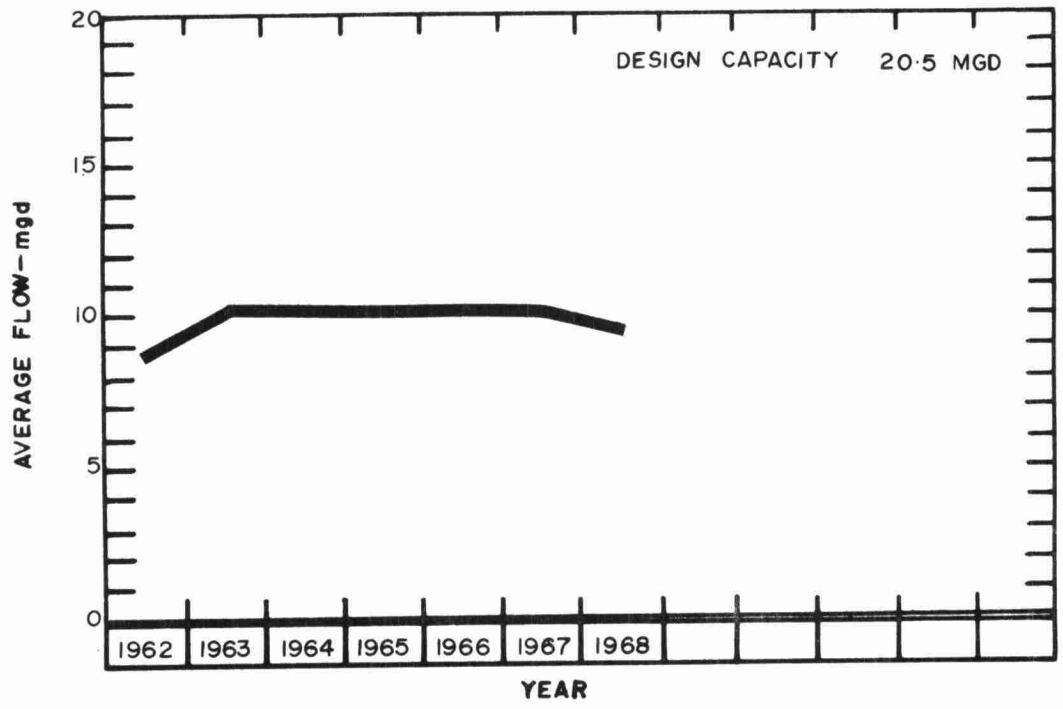

PORT MAITLAND
FLOW - mgd
20
15
10
5
0
MAXIMUM RATE
DAILY FLOW
2
5
10
15
20
30
40
50
60
70
80
85
90
95
98
PROBABILITY OF OCCURENCE - % ≥ SCALE VALUE

FLOWS


AVERAGE FLOW - mgd
20
15
10
5
0
1962
1963
1964
1965
1966
1967
1968
YEAR


WATER TREATMENT PLANT (TOTAL)
FLOW - mgd
20
15
10
5
0
MAXIMUM RATE
DAILY FLOW
2
5
10
15
20
30
40
50
60
70
80
85
90
95
98
PROBABILITY OF OCCURENCE - % ≥ SCALE VALUE

FLOWS


AVERAGE FLOW - mgd
20
15
10
5
0
DESIGN CAPACITY 20·5 MGD
1962
1963
1964
1965
1966
1967
1968
YEAR

FLOW DATA

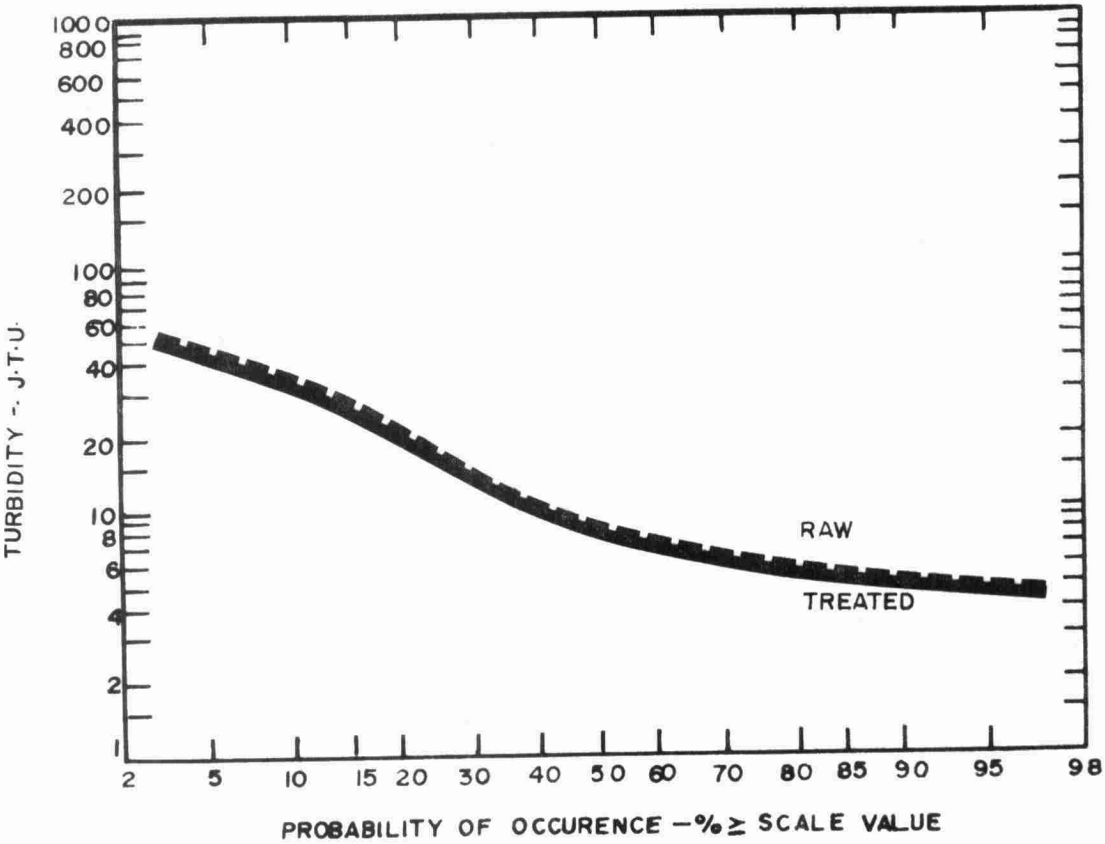
Month	Total Flow MG	Dunnville Town MG	Electric Reduction MG	Sherbrooke Metallurgical MG
January	309.347	32.457	153.022	123.868
February	289.314	34.594	145.198	109.522
March	246.520	36.170	124.098	86.252
April	261.890	33.320	130.568	98.002
May	260.178	32.488	139.238	88.452
June	293.849	33.679	119.784	140.386
July	306.289	38.199	119.137	148.953
August	183.818	42.338	87.891	53.589
September	353.672	31.812	132.827	189.033
October	342.959	31.109	142.482	169.368
November	281.065	28.115	120.613	132.337
December	293.166	24.800	138.807	129.559
Total	3,422.067	399.081	1,553.665	1,469.321

1968 FLOW HIGHLIGHTS

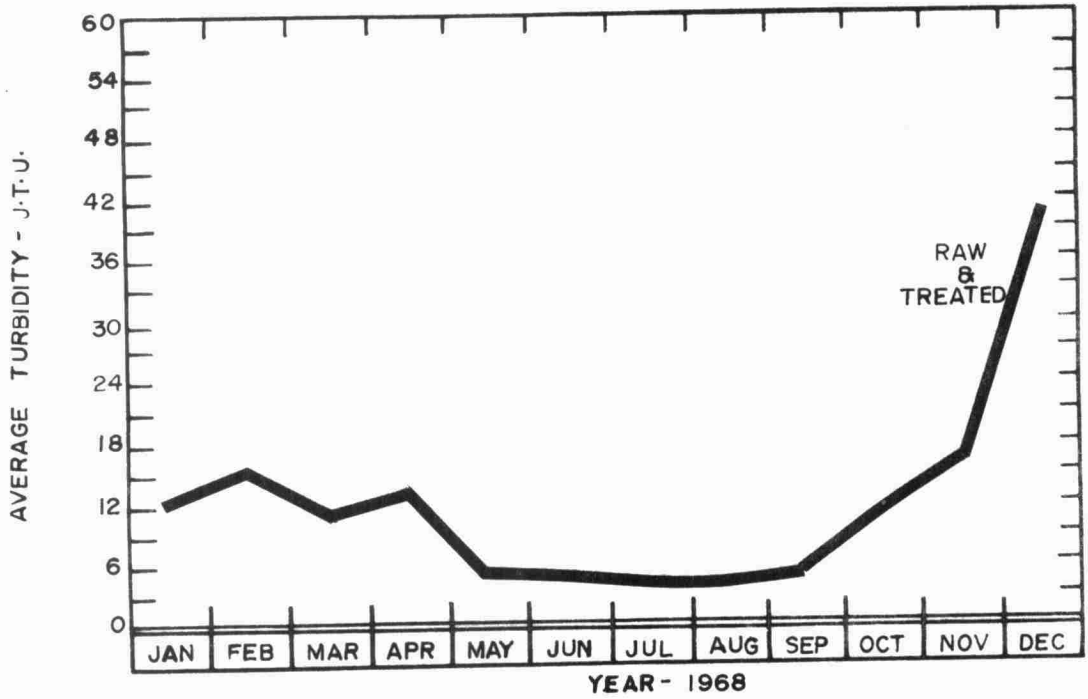
DESCRIPTION	PLANT		DUNNVILLE		PORT MAITLAND	
	DATE	FLOW	DATE	FLOW	DATE	FLOW
Max. Avg. Mthly.	Jan. -Feb.	9.98	August	1.37	Sept.	10.73
Min. Avg. Mthly.	August	5.93	December	.80	August	4.56
Max. Avg. Weekly	October	12.24	August	1.46	October	11.23
Max. Daily	October	13.68	July	1.69	October	12.47
Min. Daily	August	2.20	January	.47	August	.94
Max. Instantaneous Flow rate	October	14.71	July	3.31	August	13.12

PLANT FLOWS

Month	Total Flow (MG)	Avg. Daily Flow (MGD)	Max. Daily Flow (MG)	Min Daily Flow (MG)
January	309.35	9.98	11.82	3.15
February	289.31	9.98	11.59	8.34
March	246.52	7.95	8.92	5.85
April	261.89	8.73	10.25	6.99
May	260.18	8.39	10.25	7.49
June	293.85	9.80	11.08	8.93
July	306.29	9.88	11.96	5.18
August	183.82	5.93	12.81	2.20
September	353.67	11.79	13.09	10.54
October	342.96	11.06	13.68	8.10
November	281.06	9.37	10.69	4.29
December	293.17	9.46	9.96	8.43
Total	3422.07	-	-	-
Average	285.17	9.35	-	-


TURBIDITY - J·T·U·
1000
800
600
400
200
100
80
60
40
20
10
8
6
4
2
1
RAW
TREATED
2
5
10
15
20
30
40
50
60
70
80
85
90
95
98
PROBABILITY OF OCCURENCE —% ≥ SCALE VALUE

TURBIDITY


AVERAGE TURBIDITY - J·T·U·
60
54
48
42
36
30
24
18
12
6
0
RAW
&
TREATED
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
YEAR - 1968

TURBIDITY

The turbidity of water is a measure of the interference presented by suspended matter to the passage of light. This measurement therefore indirectly measures the suspended matter such as clay, finely divided organic matter, silt, and microscopic organisms present in the water.

The microstrainers at the Dunnville Regional Treatment Plant are designed to remove only the larger micro-organisms, particularly algae. It can be seen from the accompanying graph on turbidity measurements that the treatment process does not significantly reduce the turbidity of the raw water. It may be deduced from these results that the major source of turbidity in raw water is caused by substances smaller than can be removed by the microstrainers.

The OWRC standard for drinking water specifies a turbidity limit of one Jackson Turbidity Unit. This standard was never achieved in 1968. The average treated water turbidity for the year was approximately eight units. The worst lake conditions were encountered in the month of December, when the average turbidity was 38 units for the month. Generally, the best quality of water, using turbidity as a standard, was obtained during the months of May to October inclusive.

BACTERIOLOGICAL ANALYSIS

A total of 76 raw water samples and 232 treated water samples were submitted to the OWRC Laboratory for bacteriological analysis in 1968. The treated water samples were collected from the end of the Dunnville and Port Maitland mains and either Grandview school or Camp Goforth in Dunn Township. Of the 232 treated water samples 227 were satisfactory.

CHEMICAL ANALYSIS

A total of 50 samples of raw water and 55 samples of treated water were submitted in 1968 to the OWRC Laboratory for chemical analysis. The following table provides information on OWRC standards, and the average, maximum and minimum values as determined by analysis. The chemical and physical constituents listed are dissolved in both the raw and treated water, since there is no chemical treatment at the plant. The averages are therefore substantially the same.

CHEMICAL PROPERTY	RAW WATER				TREATED WATER				DESIRABLE STANDARDS
	No. of Samples	Avg.	Max.	Min.	No. of Samples	Avg.	Max.	Min.	
HARDNESS ($mg/l\ CaCO_3$)	10	139	152	134	11	145	160	132	< 100
ALKALINITY ($mg/l\ CaCO_3$)	10	102	113	95	11	102	120	94	30-100
IRON (mg/l Fe)	10	0.44	1.12	0.09	11	0.55	1.36	0.09	< 0.3
*COLOUR (units)	9	< 8	20	< 5	10	<19	100	< 5	< 5
CHLORIDE (mg/l Cl)	11	26	28	22	12	27	41	21	< 250

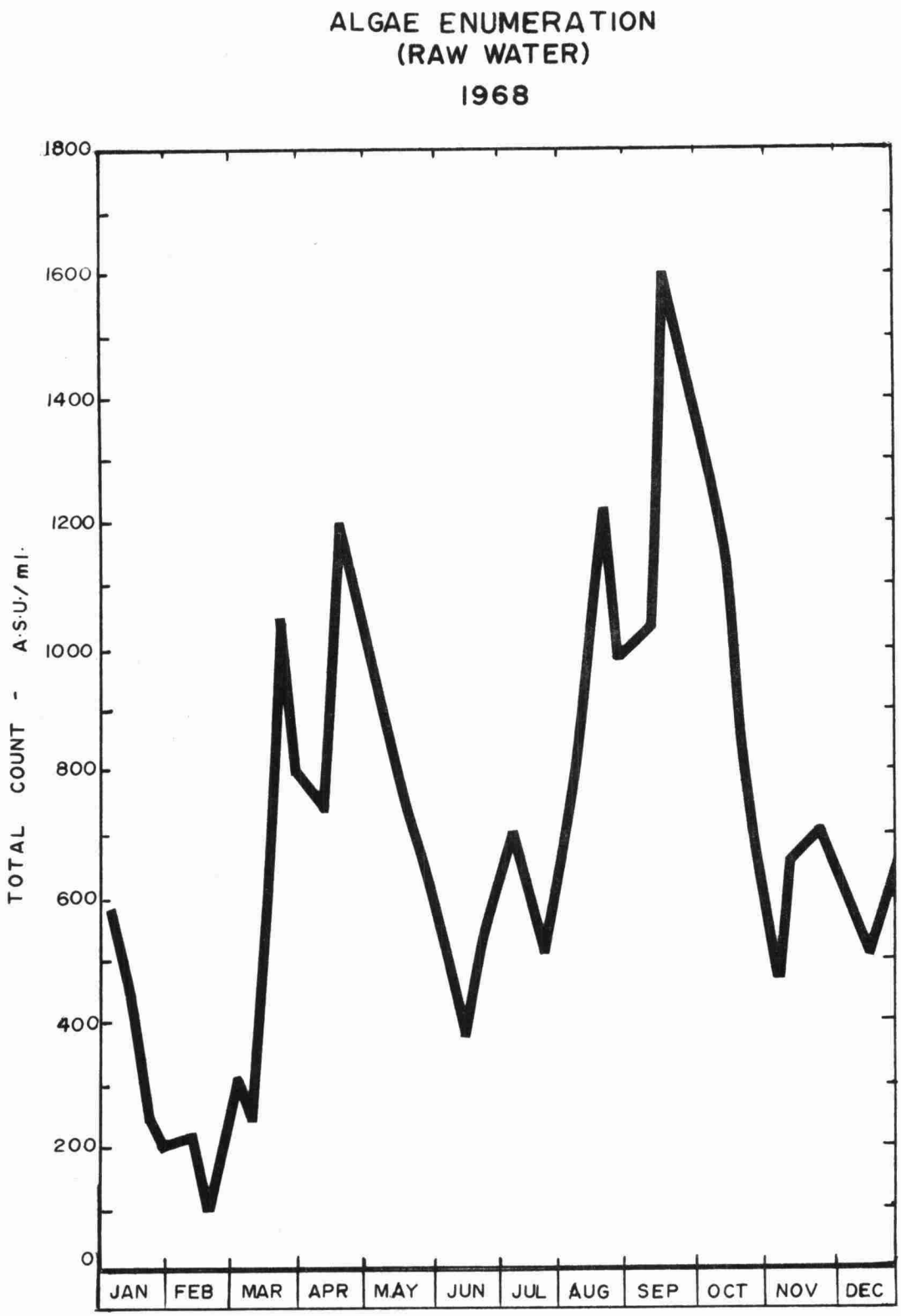
* Location of sampling points may be responsible for inconsistencies.

ALGAE ENUMERATION AND IDENTIFICATION

Algae, in addition to the ability to cause obnoxious tastes and odours, may modify the pH, alkalinity, colour, turbidity and radioactivity of the water. Corrosive activity of the water is often increased as a result of algae growth. Although there is no record of pathogenic species of algae toxic to humans, there are algae which produce toxic organic substances causing the death of wild and domestic animals. Algae have been regarded with some suspicion in cases of a general outbreak of gastro-intestinal disorders among persons using a common water supply.

Most of the algae of importance in water supplies may be categorized into four general groups - the greens, blue greens, diatoms and flagellates. The enumerations performed at the Dunnville plant have revealed that the greatest portion of algae in this area of the lake came from the greens and diatoms. Microstrainers at the plant are successful in removing a great proportion of the algae in the raw water.

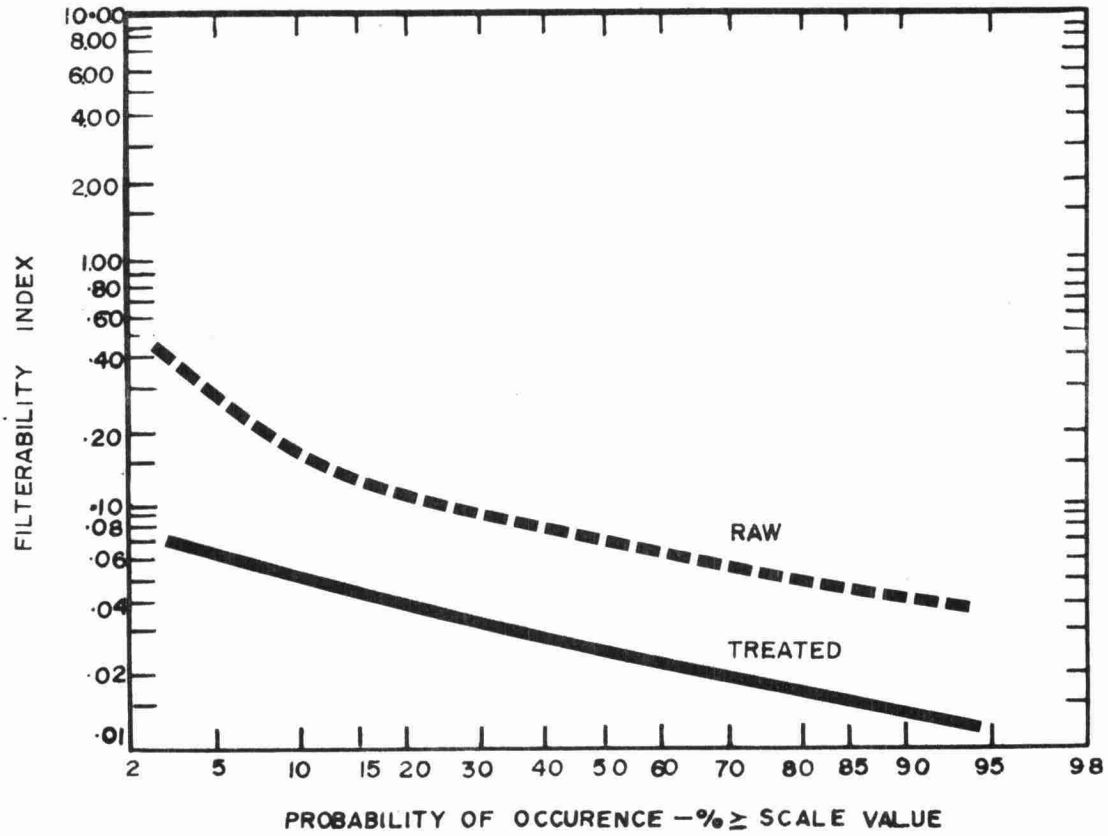
The accompanying graph shows the seasonal variations of algae in raw water.


ALGAE ENUMERATION
(RAW WATER)
1968
TOTAL COUNT - A.S.U./ml.
1800
1600
1400
1200
1000
800
600
400
200
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC

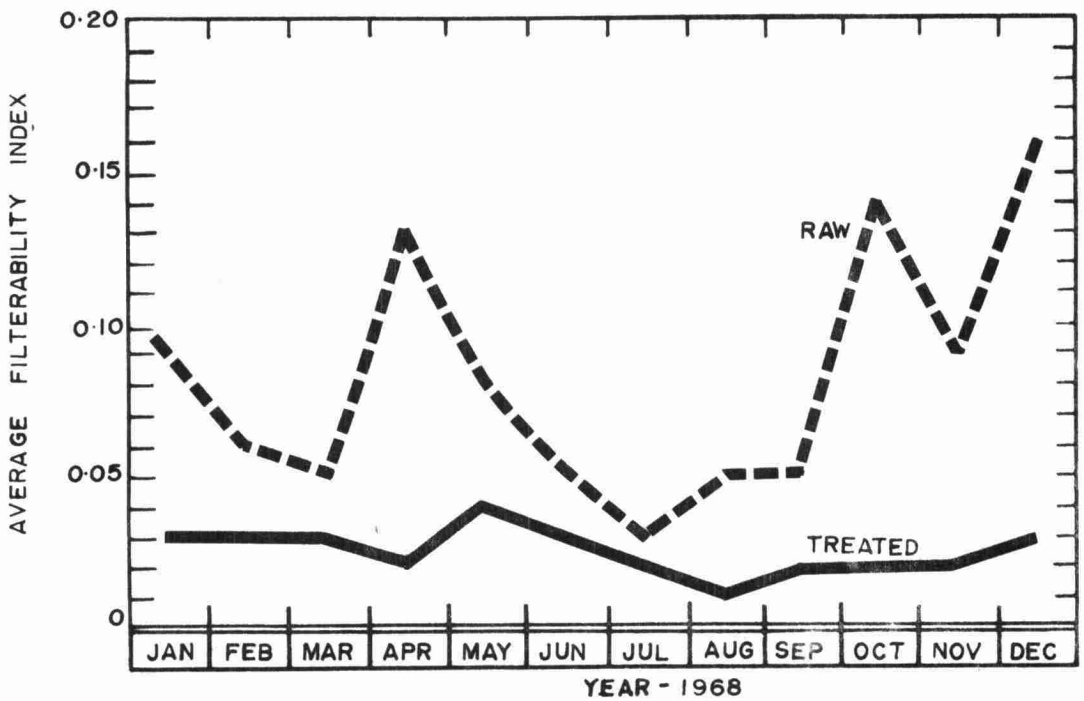
FILTERABILITY

The filterability index has been developed in connection with microstrainers in order to measure the ability to filter water. The index is affected by the type of microstrainer fabric used and the quality, particularly the turbidity, of the water to be filtered.

For a given fabric, an increase in the index indicates a poorer quality of water which decreases the capacity of the microstrainers. For a given quality of water the index will increase with an increase in the fineness of the microstrainer fabric. The microstrainers at the Dunnville plant are equipped with Mark 1 fabric having an aperture opening of 35 microns with 80,000 apertures per square inch.



FILTERABILITY INDEX



CHLORINATION AND DISINFECTION

MONTH	COLIFORMS				CHLORINE		
	RAW WATER		TREATED WATER		TOTAL USED	Prechlor. Dosage	Postchlor. Dosage
	No. of Samples Taken	Average Density No. /100 ml	No. of Samples Taken	No. with Coliform > 0/100 ml	(lbs.)	mg/l	mg/l
January	5	189	15	0	2746	0	0.9
February	5	1112	15	0	2864	0	1.0
March	6	71	18	0	2422	0	1.0
April	9	392	27	0	2674	0	1.0
May	7	2908	21	0	2774	0	1.1
June	7	710	21	0	3145	0	1.1
July	6	567	18	1	3239	0	1.1
August	6	61	18	3	1944	0	1.1
September	7	893	25	1	3360	0	1.0
October	6	28	18	0	3422	0	1.0
November	6	983	17	0	2788	0	0.9
December	6	491	19	0	3218	0	0.9
TOTAL	76	-	232	-	34596	0	-
Average	-	-	-	-	2883	0	1.01

CONCLUSIONS

The Dunnville Regional Water Supply operated effectively during 1968, treating a total of 3,422.07 million gallons of water. A number of major repairs were completed during the year. All structures and equipment remain in good condition with no major problems anticipated in the forthcoming year.

Large volumes of algae in the raw water created operating problems of a most serious nature, and for the first time since initial operation it was necessary to restrict flow to participants because of this.

RECOMMENDATIONS

It is strongly recommended that action be taken on the installation of travelling water screens in the low lift pumping station. Operating problems due to algae were the most severe during 1968 since the initial operation, and the general trend over the past eight years has been to slightly deteriorating conditions.

Water management in Ontario